CLAIMS

What is claimed is:

1. A system, comprising:

a sample holder to hold a sample;

an optical input collimator to collimate an input probe beam, and to direct the input probe beam to the sample;

a first optical shearing interferometer located to receive optical transmission of the input probe beam through the sample;

a second optical shearing interferometer located to receive optical reflection of the input probe beam from the sample; and

a processor to receive output signals from the first and the second optical shearing interferometers and operable to process the output signals to produce measurements of the sample.

2. The system as in claim 1, wherein the first and the second optical shearing interferometers are coherent gradient sensing (CGS) devices.

3. The system as in claim 2, wherein each CGS device comprises two spaced gratings whose spacing is adjustable to change a measurement resolution.

4. The system as in claim 3, further comprising a mechanism to adjustably change a relative transverse position between the two gratings without changing the spacing between the two gratings to cause a phase shift in each CGS device.

5. The system as in claim 1, further comprising a first light source to produce a first probe beam at a first probe wavelength that transmits through the sample to the first optical shearing interferometer, and a second light source to produce a second probe beam, at a second probe wavelength, that reflects at the sample to the second optical shearing interferometer.

6. The system as in claim 1, wherein the processor operates to produce full-field measurements of surface flatness, surface wedge, surface slope, and surface topology of the sample.

7. The system as in claim 1, wherein the first optical shearing interferometer is different from a CGS device.

8. A method, comprising:

directing an optical reflection off a sample plate into a first optical shearing interferometer to obtain a first map of

wavefront slopes of the optical reflection indicative of the reflective surface of the sample plate;

directing an optical transmission through the sample plate into a second optical shearing interferometer to obtain a second map of wavefront slopes of the optical transmission wavefront indicative of the variations in the optical path across the sample plate; and

processing the first and second maps to obtain information on the sample plate.

9. The method as in claim 8, further comprising adjusting incident angle of input probe light to the sample plate.

10. The method as in claim 8, wherein each optical shearing interferometer is a CGS device having two spaced gratings, the method further comprising varying the spacing of the gratings to change a measurement resolution.

11. The method as in claim 8, further comprising adjusting a wavelength of input probe light to the sample plate.

12. The method as in claim 8, wherein each optical shearing interferometer is a CGS device having two spaced gratings, the method further comprising adjusting a relative transverse

position between the two gratings without changing the spacing between the two gratings to cause a phase shift in each CGS device.

13. The method as in claim 8, further comprising:

directing optical reflection off a second reflective surface of the sample plate into a third optical shearing interferometer to obtain a third map of wavefront slopes of the optical reflection indicative of the second reflective surface of the sample plate,

wherein the processing further includes processing the third map.

14. The method as in claim 8, wherein the information to be obtained on the sample plate includes at least one of a surface flatness, surface wedge, surface slope, and surface topology of the sample plate.

15. The method as in claim 8, further comprising controlling optical polarization of a probe beam incident to the sample plate.

16. A method, comprising:

directing an optical probe beam with a uniform wavefront to transmit through a sample plate;

using an optical shearing interferometer to receive optical transmission of the input probe beam through the sample plate to produce an optical shearing interference pattern; and

processing the optical shearing interference pattern to obtain a wavefront gradient map of the optical transmission.

17. The method as in claim 16, further comprising processing the wavefront gradient to obtain a wedge slope map of the thickness of the sample plate.

18. The method as in claim 16, further comprising processing the wavefront gradient to obtain a slope map of a refractive index of the sample plate.

19. The method as in claim 16, wherein the optical shearing interferometer comprises two spaced gratings to produce the optical shearing interference pattern, the method comprising adjusting a spacing between the two gratings to change a measurement resolution.

20. The method as in claim 16, wherein the optical shearing interferometer comprises two spaced gratings to produce the

optical shearing interference pattern, the method comprising adjusting a relative transverse position between the two gratings to cause a phase shift.